

2001 South Dakota Statewide Seatbelt Survey

Final Report

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by

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Summary

A roadside observational survey of 13,904 occupants of vehicles traveling a selected sample of South Dakota rural and urban highways and interstates in 13 South Dakota counties was conducted in October and November of 2001. Observed occupants were drivers and right front passengers of any age, and additional children under age 5 in the front or back seat. Results revealed that 56.4% of occupants were wearing a seatbelt or child restraint. When this percentage was weighted for road type and vehicle miles traveled at observation sites, the statewide estimate for seatbelt/child restraint use was 63.3%. This number compares with the statewide estimate of 53.4% in the 2000 survey. The weighted statewide estimates for seatbelt use by road type were 55.4% for urban highways, 57.5% for rural highways, 67.1% for urban interstates, and 75.5% for rural interstates. These numbers compare with 2000 statewide estimates of 46.4%, 54.8%, 54.1%, and 55.2%, respectively.

Based on unweighted seatbelt rates, the highest use rates were found in east river counties of Union (70.7%), Minnehaha (69.0%), Davison (66.8%), Brown (64.1%) and the west river county of Lawrence (62.3%). Lower rates were found in Fall River (57.8%), Beadle (56.8%), Hughes (53.9%), and Grant (53.3%). Pennington County, which has the largest population base in west river South Dakota, was found to have a rate of 50.9%. Small rural counties had the lowest rates: Charles Mix (28.4%), Tripp (38.5%) and Kingsbury (44.4%). Seatbelt use rates in 11 of the 13 counties showed increases from the 2000 survey rates.

Unweighted seatbelt use rates varied by estimated age group of vehicle occupants. Of a small sample of 63 children who appeared to be under age 5, 36.5% were in a seatbelt and 41.3% were in a child restraint. Thus, the total percentage of children under age 5 who were restrained was 77.8%. This compares to a 58% restraint use estimate for a sample of 161 children observed in the 2000 survey. The 2001 seatbelt use rate for 76 children judged to be 5 to 13 years old was 63.2%. The rate for 329 teens who appeared to be between 14 and 17 years old was a surprisingly low 45.6%. The seatbelt use rate for occupants who appeared to be age 18 years and older was 56.5%. Comparable rates in the 2000 survey were 53.1% for children 5 – 13, 49.7% for teens, and 52.8% for adults.

More right front seat passengers (62.0%) than drivers (54.9%) were wearing safety restraints. Seatbelt use also varied by vehicle type. Occupants of sport utility vehicles (65.3%) and cars (60.9%) were more likely to wear safety restraints than were occupants of vans and pickups (47.7%). Finally, it was found that a higher percentage of occupants of out-of-state vehicles (67%) wore safety restraints than did occupants of vehicles with South Dakota license plates (55.2%).

Introduction

Motor vehicle injuries and fatalities are a leading cause of death and injury in the United States. According to data recorded by the South Dakota Department of Transportation, a total of 150 South Dakota residents were killed and 7,574 were injured in motor vehicle accidents in the year 1999 alone (Traffic Safety Digest, 2001). Nationwide, traffic injuries are the leading cause of injury-related deaths for all age groups and are the leading cause of death for persons aged 6 to 27 years (National Highway Transportation Safety Administration-NHTSA, 2001). It has been estimated that every 14 seconds someone in America is injured in a motor vehicle crash and that every 12 minutes a vehicle-related fatality occurs (NHTSA, 2001).

Safety restraint use significantly decreases the severity of injuries in a motor vehicle crash and in particular decreases both the incidence and severity of potentially fatal closed head injuries (Norris, Matthews, Riad, 2000). According to the NHTSA, deaths and serious disabilities caused by motor vehicle crashes could be reduced by approximately 50% with the use of safety belts and child restraint devices. Seatbelts are estimated to save 9,500 lives in America each year. Research has found that lap/shoulder belts, when used properly, reduce the risk of fatal injury to front seat passenger car occupants by 45% and the risk of moderate-to-critical injury by 50%. Yet, NHTSA records indicate that fewer than 40 percent of both adults and children who die in traffic crashes are properly restrained.

South Dakota Department of Transportation data records indicate that in the year 1999, 67.2% of motor vehicle occupants killed, and 35.3% of those injured in motor vehicle crashes were not wearing safety restraints (Traffic Safety Digest, 2001). Particularly disturbing is the high rate of fatalities observed in South Dakota for motorists under the age of 25. While those under the age of 25 represent only 18.8% of South Dakota's licensed drivers, they represented 27.6% of drivers involved in fatal crashes in the year 1999 and 36.3% of drivers involved in non-fatal crashes (Traffic Safety Digest, 2001).

These facts and figures emphasize the importance of safety restraint usage at the local level. In response to a national initiative by the NHTSA, the South Dakota Office of Highway Safety commissioned associates of the Human Factors Laboratory (HFL) at the University of South Dakota to conduct a probability-based survey of seatbelt use in the state in 1998, 2000, and in 2001. The purpose of these studies was to document the level of seatbelt use in a sample of drivers and front seat passengers traveling in noncommercial vehicles on South Dakota roads during the last quarter of 1998, 2000, and 2001. The methods and procedures developed and implemented in the 1998 study resulted in a systematic procedure that: a) could be replicated in future investigations; and, b) would establish a base rate of current seat belt use that could be compared to future investigations as a means of evaluating programmatic efforts aimed at increasing usage rates.

This report presents the methods, procedures and results of the 2001 Statewide Seatbelt Survey. As indicated, the methods used in the 2001 study were based in large part on those established in the 1998 survey and subsequently used in the 2000 survey. Modifications were made to the 1998 survey design for data collection in the 2000

survey. These modifications were again implemented in the 2001 survey design and are indicated along with a rationale for their inclusion. Results of the 2001 survey are presented followed by a discussion of the general trends observed in usage rates and implications for future surveys and public safety programming.

Methods

The methods used in this study were designed and conducted according to federal guidelines established by NHTSA and as implemented in the previous 1998 Statewide Seatbelt Survey. The methods and procedures described below are in compliance with the “Uniform Criteria for State Observational Surveys of Seat Belt Use”, published in the Federal Register on September 1, 1998 (63 F.R. 463389). One modification to the design of this survey was implemented in an effort to increase the observational rate for children under the age of 5 years.

Survey Design: Stage 1

This study utilized the geographic sampling techniques and road segment sites established in the 1998 survey. These road segment sites were established in 1998 based on the following process. The first step was to select geographic areas for sampling of traffic. South Dakota is a state with less than 800,000 citizens residing in 66 counties. The population is not evenly distributed throughout the state, as 50% of the citizens live in eight counties with urban centers. Many of the remaining 58 counties have low populations residing in largely rural areas.

Because it is difficult to sample traffic in all areas of a state with a low population, a “multi-stage cluster approach” was utilized. In this plan recommended by NHTSA guidelines, sampling can be restricted to the counties that account for 85% of the state’s population. Therefore, the sampling pool was comprised of the 33 largest counties in South Dakota that account for 85% of South Dakota’s population. Table 1 shows the eligible counties in ascending order according to population size.

Table 1: Largest South Dakota Counties Accounting for 85% of the State Population.

| | County | Population | % of | Cumulative % |
|------|--------------------|-------------------|----------------|---------------------|
| 1-33 | | | | 14.44% |
| 34 | <i>Dewey</i> | 5,668 | 0.77% | 15.21% |
| 35 | <i>McCook</i> | 5,686 | 0.77% | 15.98% |
| 36 | <i>Kingsbury</i> | 5,830 | 0.79% | 16.77% |
| 37 | <i>Day</i> | 6,421 | 0.87% | 17.64% |
| 38 | <i>Moody</i> | 6,538 | 0.89% | 18.53% |
| 39 | <i>Tripp</i> | 6,883 | 0.93% | 19.46% |
| 40 | <i>Custer</i> | 6,966 | 0.94% | 20.40% |
| 41 | <i>Fall River</i> | 7,123 | 0.97% | 21.37% |
| 42 | <i>Bon Homme</i> | 7,677 | 1.04% | 22.41% |
| 43 | <i>Spink</i> | 7,700 | 1.04% | 23.45% |
| 44 | <i>Grant</i> | 8,048 | 1.09% | 24.54% |
| 45 | <i>Hutchinson</i> | 8,102 | 1.10% | 25.64% |
| 46 | <i>Turner</i> | 8,633 | 1.17% | 26.81% |
| 47 | <i>Butte</i> | 8,926 | 1.21% | 28.02% |
| 48 | <i>Todd</i> | 9,296 | 1.26% | 29.28% |
| 49 | <i>Charles Mix</i> | 9,493 | 1.29% | 30.57% |
| 50 | <i>Roberts</i> | 9,973 | 1.35% | 31.92% |
| 51 | <i>Lake</i> | 10,647 | 1.44% | 33.36% |
| 52 | <i>Union</i> | 11,959 | 1.62% | 34.98% |
| 53 | <i>Shannon</i> | 12,010 | 1.63% | 36.61% |
| 54 | <i>Clay</i> | 15,370 | 2.08% | 38.69% |
| 55 | <i>Hughes</i> | 15,404 | 2.09% | 40.78% |
| 56 | <i>Beadle</i> | 17,976 | 2.44% | 43.22% |
| 57 | <i>Davison</i> | 18,807 | 2.55% | 45.77% |
| 58 | <i>Lincoln</i> | 20,152 | 2.73% | 48.50% |
| 59 | <i>Yankton</i> | 21,013 | 2.85% | 51.35% |
| 60 | <i>Meade</i> | 21,999 | 2.98% | 54.33% |
| 61 | <i>Lawrence</i> | 22,131 | 3.00% | 57.33% |
| 62 | <i>Codington</i> | 25,452 | 3.45% | 60.78% |
| 63 | <i>Brookings</i> | 26,186 | 3.55% | 64.33% |
| 64 | <i>Brown</i> | 35,701 | 4.84% | 69.17% |
| 65 | <i>Pennington</i> | 87,190 | 11.81% | 80.98% |
| 66 | <i>Minnehaha</i> | 140,518 | 19.04% | 100.00% |
| | Total | 737,9733 | 100.00% | |

Following NHTSA guidelines, a sample of 13 counties could be drawn for a state with at least 85% of the population residing in 30 – 39 counties. The two largest counties in the state were selected and the remaining 11 counties were randomly drawn. Table 2 lists the counties that were selected and their corresponding populations.

Table 2: Selected Counties and Their Populations

| County | Population |
|----------------|-------------------|
| 1. Minnehaha | 140,518 |
| 2. Pennington | 87,190 |
| 3. Brown | 35,701 |
| 4. Lawrence | 22,131 |
| 5. Davison | 18,807 |
| 6. Beadle | 17,976 |
| 7. Hughes | 15,404 |
| 8. Union | 11,959 |
| 9. Charles Mix | 9,493 |
| 10. Grant | 8,048 |
| 11. Fall River | 7,123 |
| 12. Tripp | 6,883 |
| 13. Kingsbury | 5,830 |

Although Hutchinson County was initially drawn for the sample, it was learned that the county would be undergoing a local seatbelt survey in the fall of 1998. Therefore, Tripp County was substituted.

Survey Design: Stage 2

The second stage of the study was to select the sample of road segments to be surveyed within the thirteen counties. According to NHTSA guidelines, road segments must be drawn from roads that have an adequate level of traffic based upon Vehicle Miles Traveled (VMT) estimates. Initially, it was estimated that there were an average number of 50 road segments available for sampling in the South Dakota counties. According to the NHTSA guidelines, 19 road segments can be sampled from a base of 50 road segments per county.

However, assessment of 1998 VMT estimates for South Dakota roadways revealed that only an average number of 27 road segments were available for sampling in the 13 counties. (Relative to other states, South Dakota has a limited number of roadways for which VMT estimates are recorded.) Therefore, permission was received from the regional survey design advisor to sample 17 or fewer road segments per county.

In order to select the road segments, maps of roadways and VMT estimates per roadway segments for the 13 counties were obtained from the South Dakota Department of

Transportation, Division of Planning and Engineering. Roadways were divided into four classifications:

Urban Interstate

Urban Highway -- principal and minor highways within designated urban areas
(5,000 + population)

Rural Interstate

Rural Highways -- principal and minor highways outside of urban areas.

Following recommendations from the regional survey design advisor, road segments for urban interstate and urban highways were measured in one mile units, whereas road segments for rural interstate and rural highways were measured in ten mile units. VMT estimates were calculated for each road segment chosen. Road segments with unacceptably low VMT estimates were excluded. Once all of the roadways in a county were divided into eligible segments, a random numbers program was used to select 17 segments for sampling.

The random selection procedure was restricted by the roadway classification of a segment so that the number of segments chosen would be proportionate to the total VMT traveled on a roadway type for that county. For example, in Minnehaha County, the proportions of total vehicle miles traveled by roadway type were:

23% for Urban Interstate

43% for Urban Highways

25% for Rural Interstate

10% for Rural Highways.

Therefore, the drawing of selected road segments was restricted to:

4 Urban Interstate sites (about 23% of 17 sites)

7 Urban Highway sites (about 43% of 17 sites)

4 Rural Interstate sites (about 25% of 17 sites)

2 Rural Highway sites (about 10% of 17 sites).

The procedure described above was applied individually to the 13 counties for final selection of the 17 road segments. Five counties (Brown, Davison, Grant, Kingsbury, and Tripp) had only 13 to 16 road segments chosen because of a limited number of roadways with VMT data available.

The last step in the road segment selection process was to designate a seatbelt observation site within each of the 205 selected road segments. Whenever possible, the observation site was placed at an intersection in which vehicles slowed or stopped for a traffic signal or sign. This allowed for accurate and safe viewing of seatbelt use by the Observers. See Appendix A for a list of the observation sites by mile marker and probability of selection in counties by the four roadway types.

Sampling Time Periods

Six 90-minute blocks of daylight time were scheduled for seatbelt observations. One observation time period was 40 minutes. Including travel time, six sites could be observed in a single day. A county could therefore be surveyed in a four-day period. To minimize travel time and distance required to conduct the survey, sample sites were grouped into geographic clusters. A day of the week to begin data collection was assigned to a cluster. Within a cluster, each road segment was randomly assigned to the available time slots. The time blocks were:

- 1) 7:30AM - 9:00AM
- 2) 9:00AM - 10:30AM
- 3) 10:30AM - 12 noon
- 4) 12 noon - 1:30PM
- 5) 1:30PM - 3:00 PM
- 6) 3:00PM - 4:30PM

Sample Size

Based on previous observational surveys in South Dakota, it was estimated that approximately 10,000 vehicle observations would be collected from the 205 sites. This sample size allows one to be 95% confident that the numbers reported would be within 1% of the actual values -- an acceptable margin of error according to NHTSA guidelines.

Data Collection

For the 2000 survey, the 1998 data collection form was modified to reflect the inclusion of additional child passengers between 0-4 years of age. This modification was also implemented in the 2001 survey. A copy of this modified form is included on the last page of the Observer Manual in Appendix B. The data collection form was designed for recording seatbelt use (yes or no) by front seat drivers and right-side passengers of each vehicle observed in the survey. The modified form also included instructions for recording additional front seat passengers and back seat passengers who were under the age of five years. The form allowed collection of other information of interest to the South Dakota Office of Highway Safety, including child restraint use for all passengers who appeared to be under age five, estimated age of drivers and passengers, vehicle type, and in- or out-of-state license plate of the vehicle. Demographic data were also collected for each vehicular observation period including county, site number, time of day, date, observer initials, and roadway type. Data were collected for all passenger cars, pickups, vans, and sport utility vehicles observed. Commercial trucks and motor homes were excluded.

Observers, Observation Procedures, and Observer Training

Two Observers were assigned to a county. The Observers were members of a retired citizen group who have a background in driver education. Members of this group have been found to be accurate and motivated observers of seatbelt use in previous surveys. Observers received (1) a list of observation sites and a description and maps of the site locations for their respective counties, (2) a four-day schedule for completing a 40-minute observation period of each site in their county, and (3) an instruction manual explaining how to conduct

roadside observations. In addition, the Office of Highway Safety issued Observers safety vests and clipboards. Observers received training through a series of telephone conference calls with the HFL investigators. They were instructed to read the manual and engage in a practice period using local traffic. After the practice period, Observers received a final call from the investigators to review procedures.

Observers were instructed to follow their observation schedules as closely as possible. In the event that Observers could not complete a scheduled site due to weather or complications, they were instructed to call the HFL investigators for reassignment of that site. Observers were asked to stand or park in a safe viewing place when they reached an observation site. They were to station themselves so that they could view traffic traveling in a pre-designated direction on the pre-designated roadway. Observers were instructed to monitor every vehicle if the traffic flow was regular or light, and every other vehicle if the traffic flow was heavy. Observers monitored traffic for 40 minutes of the 90 minute observation period, and used the remaining minutes for travel time and location of a safe observation point.

The data collection procedures are explained in detail in the “Observer Manual – 2001 South Dakota Seatbelt Survey” in Appendix B.

Results

A total of 14,201 observations were made from the 13 selected counties. After excluding several hundred observations unusable due to observer error, there were 13,904 observations. A small percentage of observations could not be included in individual analyses due to actual missing data. Table 3 presents a summary of unweighted data regarding overall seatbelt restraint use in each county as well as the total number of observations per county. Of the 13,904 motorists, 7845 or 56.4% were wearing shoulder safety restraints or were placed in a child restraint, while 6059 or 43.6% were not wearing safety restraints. Restraint use was coded “yes” if there was an observed presence of a shoulder harness. Using the presence of a shoulder strap to indicate seatbelt restraint usage has been demonstrated in previous research to result in the highest accuracy rate as compared to other existing methods. Child restraint use was coded “yes” if a child was seated in a restrained child safety seat regardless of whether or not a shoulder restraint securing the child safety seat was in view.

Table 3: Restraint Use by County

| County | Restraint Used | | Total |
|--------------------|-----------------------|--------------|--------------|
| | Yes | No | |
| Minnehaha | 987 69.0% | 443 31.0% | 1430 |
| Pennington | 569 50.9% | 548 49.1 | 1117 |
| Brown | 902 64.1% | 506 35.9% | 1408 |
| Lawrence | 881 62.3% | 534 37.7% | 1415 |
| Davison | 777 66.8% | 387 33.2% | 1164 |
| Beadle | 757 56.8% | 576 43.2% | 1333 |
| Hughes | 808 53.9% | 692 46.1% | 1500 |
| Union | 417 70.7% | 173 29.3% | 590 |
| Charles Mix | 186 28.4% | 469 71.6% | 655 |
| Grant | 457 53.3% | 401 46.7% | 858 |
| Fall River | 303 57.8% | 221 42.2% | 524 |
| Tripp | 309 38.5% | 494 61.5% | 803 |
| Kingsbury | 492 44.4% | 615 55.6% | 1107 |
| Total | 7845 | 6059 | 13904 |
| % of Total | 56.4% | 43.6% | |

Estimate of Statewide Seatbelt Use

The statewide estimate of seatbelt use was obtained by finding the percentage of seatbelt use for each site, and then computing a weighted mean for each road type for each county. Then, a weighted average for each road type across counties was found where the weights were the VMT (vehicle miles traveled) for that county on that road type and the sampling weight for the county based on the probability of its selection to be included in the survey. Finally, the estimates for the four road type averages were weighted by the VMT for each road type for the entire state. The resulting estimate for seatbelt use on all South Dakota roads 63.3%, with a standard deviation of 0.464. Thus,

it can be said that there is a 95% probability that the true rate of seatbelt use for South Dakota roads ranges between 62.4% and 64.2%. The formulas and weights for calculating the statewide estimate and standard deviation are in Appendix C.

Because the statewide estimated seatbelt use rate for 2001 was notably larger than the 53.4% statewide rate estimated in 2000, inspection of the rate components is informative. In 2001, the estimated rate for urban highways was 55.4%; the estimated rate for rural highways was 57.5%; the estimated rate for urban interstates was 67.1% and for rural interstates was 75.5%. The corresponding rates for 2000 were 46.4%, 54.8%, 54.1%, and 55.2%, respectively. A comparison indicates a 9% increase in the use rate for urban highways, an increase of a few percentage points for rural highways, a 13% increase for urban interstates, and an increase of 20% for rural interstates.

Although we believe there is a real increase in the seatbelt use rate in the state, the 20% increase for rural interstates was large enough to warrant further exploration. We discovered that in 2000, several rural interstate sites in Pennington County were not surveyed due to inclement weather. The remaining sites had limited numbers of vehicles observed, again due to inclement weather. The end result was a relatively low use rate (30.8%) that may have lowered the rural interstate rate and the statewide use rate inappropriately. The same county reported a rural interstate rate of 56.5% in 2001. Thus we believe that the increase in statewide use rate, while real and large, is partly due to a lower-than-actual statewide estimate reported in 2000.

Seatbelt Restraint Use by County

As illustrated in Table 3, unweighted seatbelt use was highest in Union County where 70.7% or 417 of the 590 motorists observed were wearing safety restraints. This compares with a 61.1% rate observed in Union County in the 2000 survey. In the 2001 survey, Minnehaha County had the next highest rate of seatbelt use with 69% or 987 of the 1430 motorists observed wearing a safety restraint. This rate was higher than the 57.1% rate observed in Minnehaha County in the 2000 survey. The 2001 rate observed in Davison County was 66.8% or 777 out of 1164 motorists wearing a safety restraint. In comparison, the 2000 seatbelt use rate for Davison County was 52.4%.

Seatbelt use was lowest in Charles Mix County where only 28.4% or 186 of 655 motorists observed were wearing a safety restraint. Despite the modest usage rate observed in this county, the rate was slightly higher than the 2000 survey rate of 23.6% for Charles Mix. The next lowest rate of restraint use in the 2001 survey was in Tripp County where only 38.5% of 803 motorists wore seatbelts. This rate was higher than the 30.1% rate observed in 2000.

Several counties had restraint usage rates in the 50-60% range. Brown had an observed restraint usage rate of 64.1% or 902 of 1408 observed motorists. This rate was moderately higher than the 2000 rate of 59.5%. Lawrence County had a rate of 62.3% or 881 of 1415 occupants, which was lower than the 2000 rate of 72.6%. It is possible that the rainy and snowy weather conditions of the 2000 survey in Lawrence County led to

unusually high seatbelt use. Beadle had a 2001 rate of 56.8% or 757 of 1333 observed motorists. This rate was similar to the 2000 rate of 55.8% for Beadle.

Fall River's rate of 57.8% (303 of 524 motorists) was higher than the 2000 rate of 51.5%. Pennington County's 50.9% rate for the 2001 survey (569 of 1117 occupants) was higher than the 2000 rate of 42.1%. Similarly, Grant County's 2001 use rate of 53.5% (457 of 858 occupants) was higher than the 2000 use rate of 45.7%. Kingsbury's 2001 rate increased to 44.4% (492 of 1107 occupants) as compared to a 2000 rate of 37.5%. Finally, Hughes County's 2001 rate increased dramatically to 53.9% (808 of 1500 occupants) as compared to a 2000 rate of 36.2%. In summary, 11 out of 13 counties showed an increase in seatbelt use rates from the 2000 to the 2001 survey periods. One county (Lawrence) showed a decrease, and one county (Beadle) had similar rates for the two survey periods.

Age of Motorist

Observers estimated the age of drivers and front seat passengers to the best of their ability. If the observer was unable to determine age, these few instances were excluded from the age by restraint use analyses. As in the 1998 and 2000 surveys, observers always recorded data for the driver and a right front passenger, irrespective of age. In the 2000 and 2001 surveys, if an additional passenger between 0-4 years of age was present in the front seat (e.g., on the right front passenger's lap or in the middle of the seat), data for this passenger were recorded. Data were also recorded for any child between 0-4 years of age riding in the back seat. This new protocol was adopted to increase the sample size of child passengers age 0-4 years for better estimates of child restraint use.

Child restraint use was defined as a passenger restrained by a child carrier. If children under the age of 5 years were observed riding in the front seat of a vehicle unrestrained, this was recorded as no restraint used. If a child under five years of age was observed riding in the front passenger seat wearing a shoulder restraint but not seated in a child carrier, then restraint use was recorded as a "yes". Note however, that according to South Dakota law, all children under the age of 5 years should be restrained in an approved child safety restraint unless they weigh more than 40 pounds. Table 4 illustrates the total number of observations and restraint use by each age group including the use of child restraints.

Table 4: Restraint Use by Age

| Age | Restraint Use | | | Total |
|----------------------|---------------|-----------------|---------------|-------|
| | Belt | Child Restraint | None | |
| 0-4 years | 23 36.5% | 26 41.3% | 14 22.2% | 63 |
| 5-13 years | 48 63.2% | 1 1.3% | 27 35.5% | 76 |
| 14-17 years | 150 45.6% | | 179 54.4% | 329 |
| 18 & over | 7597 56.5% | | 5839 43.5% | 13436 |
| Total | 7818 56.2% | 27 .2% | 6059 43.6% | 13904 |

The new protocol resulted in observation of a total of 63 children between 0-4 years of age. Of these, a total of 77.8 % were observed in some type of safety restraint: 41.3% (26/63) were buckled in a child safety restraint and another 36.5% (23/63) were wearing a shoulder restraint, but not seated in a child safety seat. The remaining 22.2% (14/63) were not wearing any type of safety restraint. The 77.8% restraint use rate for children 0-4 years is higher than the comparable rate of 58% observed for children 0-4 years in the 2000 survey. However, the sample size of children 0-4 years for the 2001 survey (63) was substantially smaller than for the 2000 survey (161).

A total of 76 children between 5-13 years of age were observed. Of these, 49 or 64.5% were wearing some type of safety restraint, with 1 child observed in a child safety seat and another 48 wearing a standard safety belt type restraint. Twenty-seven or 35.5% children aged 5-13 were not wearing a restraint of any type. However, the 64.5% use rate for 5-13 year olds was substantially higher than the rate of 51.3% (60/117) observed for this age group in the 2000 survey.

A total of 329 motorists were estimated to be in age category of 14 to 17 years of age. Of these, 150 or 45.6% were wearing a safety restraint. This use rate for this age group in the 2000 survey was 49.7% (186/374). The overwhelming majority of observed motorists (a total of 13,436) were estimated to be in the age group of 18 years and older. Of these, 7597 (56.5%) were wearing a restraint. The use rate for the adult age group in the 2000 survey was 53.2% (6449/12,112).

Drivers versus Passengers

According to guidelines, data were recorded for all drivers and right front seat passengers. Data for additional passengers were only recorded if the additional passenger was under the age of 5 years (0-4 years).

Unweighted data for restraint use by occupant position in the vehicle is presented in Table 5. Restraint use was somewhat higher for passengers than for drivers. Of the 11,007 drivers observed, 6045 or 54.9% were observed wearing safety restraints. Of the 2858 right front seat passengers observed, 1760 or 61.6% were wearing shoulder restraints, with an additional 11 or .4% in a child safety seat.

According to federal and state guidelines, children 0-4 years of age should be placed in a child safety restraint in the back seat, where possible. As indicated in Table 5, 82.5% (24 of 29) of the 0-4 year age children seated in the back seat were in fact observed in some type of safety restraint. However, only 10 of 29 or 34.5% were in a child restraint.

A very small number of additional child front seat passengers were recorded. Due to the small sample size (10) the reliability of these observation rates may be in question. However, with this consideration it is noted that 50% or 5 of the 10 children were observed using some type of safety restraint.

Table 5: Restraint Use for Drivers versus Passengers.

| Occupant Type | Restraint Use | | | Total |
|---|----------------------|------------------------|---------------|--------------|
| | Yes | Child Restraint | None | |
| Drivers | 6045 54.9% | | 4962 45.1% | 11007 |
| Right –Front Passengers | 1760 61.6% | 11 .4% | 1087 38.0% | 2858 |
| Additional Child Front Passenger | 3 30% | 2 20% | 5 50% | 10 |
| Child Passenger Back Seat | 10 34.5% | 14 48.3% | 5 17.2% | 29 |
| Total | 7818 56.2% | 27 .2% | 6059 43.6% | 13904 |

Vehicle Type

Only non-commercial vehicles were observed. Vehicles were categorized into three classifications: cars; vans, mini-vans, pickups and station wagons; and Sport Utility Vehicles (SUVs). Table 6 presents a summary of data regarding restraint use in each

vehicle category. The ratio of restraints worn per motorist is considerably higher in categories of cars (60.9%) and Sport Utility Vehicles (65.3%) than the rate observed for vans/pickups (47.7%). This trend was also observed in the 1998 and 2000 surveys.

Type of Roadway

Four types of road segments were eligible for inclusion in the survey, including urban and rural highways and urban and rural interstates. In order to be classified

Table 6: Restraint Use by Vehicle Type

| Vehicle Type | Restraint Use | | | Total |
|-------------------------------|---------------|-----------------|---------------|-------|
| | Yes | Child Restraint | None | |
| Cars | 3996 60.9% | 16 .2% | 2553 38.9% | 6565 |
| Vans/Pickups | 2636 47.7% | 6 .1% | 2879 52.1% | 5521 |
| Sport Utility Vehicles | 1185 65.3% | 5 .3% | 626 34.5% | 1816 |
| Total | 7817 | 27 | 6058 | 13902 |

“urban” the road must pass through a city with a population of at least 5000 people.

In-State versus Out-of-State Vehicles

Observers recorded whether or not the vehicles included in the observation had in or out-of-state license plates. The overwhelming majority of observations were of vehicles with in-state license plates (89.5% or 12,364 out of 13,814). As illustrated in Table 7, vehicles with out-of-state license plates tended to have higher rates of seatbelt restraint use (66.9%) than did motorists traveling in vehicles with in-state license plates (55%).

Table 7: Restraint Usage Observed for In-and Out-of State License Plates

| License Plates | Restraint Use | | | Total |
|---------------------|---------------|-----------------|---------------|-------|
| | Yes | Child Restraint | None | |
| In-State | 6800 55% | 23 .2% | 5541 44.8% | 12364 |
| Out-of-State | 970 66.9% | 4 .3% | 476 32.8% | 1450 |
| Total | 7770 56.2% | 27 .2% | 6017 43.6% | 13814 |

Discussion

Results of the current survey established that the weighted statewide estimate of restraint use for South Dakota in year 2001 was 63.3%. It appears that restraint use in South Dakota roadways has increased from a weighted statewide estimate of 45% in 1998 to 53.4% in 2000 to the current rate of 63.3%. This increase can be considered substantial because nationwide seatbelt use rates have increased by only a few percentage points in recent years: 68% in 1996, 68.9% in 1998, and 71% in 2000 according to NHTSA records.

Despite the demonstrated positive upward trend in South Dakota seat belt usage, overall statewide rates fall below the national average. Rates of safety restraint use for children continue to be low relative to many other states.

Child Restraint Use

Nationwide, the leading cause of death and disability for children over the age of one year is motor vehicle accidents (Winston, Durbin, Kallan, & Moll, 2000). According to NHTSA figures, most children killed in automobile accidents are not restrained. It is estimated that in an automobile accident, rear-facing infant seats reduce the risk of fatal injury for young children by as much as 71%, while seatbelts reduce the risk of fatal injury for young children by only 45% (NHTSA, 2001). Despite these figures, many children continue to travel in motor vehicles without adequate safety restraints. Although rates observed in this 2001 survey were higher than rates observed in both the 1998 and 2000 surveys, currently 22.2% of children 0-4 years of age were not wearing any type of safety restraint. Additionally, another 36.5% were wearing only a seatbelt without being secured in a child safety restraint.

Winston et al. (2000) investigated the safety restraint use of children between 2 to 5 years of age and motor vehicle accident severity as determined through insurance records. In particular, Winston and colleagues examined the practice of prematurely moving preschool aged children from child safety restraints to seatbelts. During a one-year period (December 1, 1998 to November 30, 1999) insurance records for 15 states and the District of Columbia for one insurance company included reports for 2077 children between 2-5 years of age who were involved in motor vehicle crashes. Records indicated that 98% of these children were restrained, but nearly 40% were restrained by a seat belt only. Winston et al. (2000) found that children wearing only seatbelts were 3.5 times more likely to suffer significant injury as compared to children in a child safety restraint.

The current South Dakota Observational Survey found use rates of seatbelts only (no child restraint) comparable to those discussed by Winston and colleagues for children in the age category of 0-4 years. Note that according to South Dakota law, for children over the age of 4 years or children weighing over 40 lbs, a seat belt is legally adequate for safety restraint purposes.

Recommendations for Future Surveys

Child Restraint Observations. The revised sampling protocol initiated in the 2000 survey and continued in the 2001 survey substantially increased the overall observed rate for children as compared to the 1998 survey. However, observation rates remain low for persons under the age of 18 years. The low observation rate for children under the age of five may exist in part because children are more difficult to see relative to adults, particularly while in the back seat. Tinted rear windows may add to this problem. However, due to the particular significance of tracking child safety restraint use, additional sampling procedures are warranted. Current child passenger safety initiatives supported by the National Highway Traffic Safety Administration recommend that all children under age 12 ride in the back seat in an age appropriate safety restraint (NHTSA, 2002). Future surveys research designers might consider extending the observational protocol to include recording restraint usage for all children under the age of 13. Additionally, future survey designers might consider planning additional observation sites at places where children are likely to be observed in residential or other slow moving traffic areas such as near day cares, schools and public libraries.

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Appendix A

List of Observation Sites by Roadway Type

Urban Interstate

| County | Road | Mile | Site # | Probability of Selection for County |
|------------|------|------|--------|-------------------------------------|
| Minnehaha | 29N | 77 | 2 | .31 |
| Minnehaha | 29N | 98 | 3 | .31 |
| Minnehaha | 229 | 3 | 4 | .31 |
| Minnehaha | 229 | 5 | 5 | .31 |
| Minnehaha | 229 | 7 | 6 | .31 |
| Pennington | 90E | 56 | 11 | .18 |
| Pennington | 90E | 60 | 12 | .18 |
| Lawrence | 90 | 13 | 2 | 1.00 |
| Davison | 90 | 330 | 8 | 1.00 |
| Davison | 90 | 333 | 10 | 1.00 |
| Union | 29S | .98 | 1 | 1.00 |

Rural Interstate

| | | | | |
|------------|-----|-----|----|------|
| Minnehaha | 90 | 379 | 13 | .19 |
| Minnehaha | 90 | 390 | 14 | .19 |
| Minnehaha | 90 | 412 | 15 | .19 |
| Pennington | 90E | 66 | 13 | .31 |
| Pennington | 90E | 90 | 14 | .31 |
| Pennington | 90E | 98 | 15 | .31 |
| Pennington | 90W | 55 | 16 | .31 |
| Pennington | 90W | 62 | 17 | .31 |
| Lawrence | 90 | 12 | 1 | 1.00 |
| Lawrence | 90E | 15 | 3 | 1.00 |
| Lawrence | 90E | 27 | 4 | 1.00 |
| Lawrence | 90W | 12 | 5 | 1.00 |
| Lawrence | 90W | 15 | 6 | 1.00 |
| Lawrence | 90W | 24 | 7 | 1.00 |
| Davison | 90 | 319 | 6 | 1.00 |
| Davison | 90 | 325 | 7 | 1.00 |
| Davison | 90 | 332 | 9 | 1.00 |
| Union | 29N | 1 | 2 | 1.00 |
| Union | 29N | 18 | 3 | 1.00 |
| Union | 29N | 27 | 4 | 1.00 |
| Union | 29S | 42 | 5 | 1.00 |
| Grant | 29 | 201 | 16 | 1.00 |

Urban Highway

| | | | | |
|------------|------|-----|----|------|
| Minnehaha | 115 | 84 | 7 | .70 |
| Minnehaha | 115 | 87 | 8 | .70 |
| Minnehaha | 115 | 88 | 9 | .70 |
| Minnehaha | 11 | 79 | 10 | .70 |
| Minnehaha | 42 | 363 | 11 | .70 |
| Minnehaha | 42 | 367 | 12 | .70 |
| Minnehaha | 38 | 365 | 17 | .70 |
| Pennington | 16 | 69 | 2 | .18 |
| Pennington | 16B | 68 | 3 | .18 |
| Pennington | 16B | 70 | 4 | .18 |
| Pennington | 79 | 80 | 6 | .18 |
| Pennington | 44 | 40 | 7 | .18 |
| Pennington | 44 | 49 | 8 | .18 |
| Brown | 12 | 289 | 4 | 1.00 |
| Brown | 12 | 290 | 5 | 1.00 |
| Brown | 12 | 292 | 6 | 1.00 |
| Brown | 12E | 289 | 8 | 1.00 |
| Brown | 281 | 193 | 9 | 1.00 |
| Brown | 281N | 197 | 14 | 1.00 |
| Lawrence | 14A | 9 | 14 | .13 |
| Lawrence | 14A | 10 | 15 | .13 |
| Davison | 37 | 74 | 3 | .60 |
| Davison | 37 | 76 | 4 | .60 |
| Davison | 38 | 300 | 12 | .60 |
| Beadle | 37 | 125 | 13 | 1.00 |
| Beadle | 37 | 127 | 14 | 1.00 |
| Beadle | 37 | 128 | 15 | 1.00 |
| Hughes | 14E | 230 | 3 | 1.00 |
| Hughes | 14W | 232 | 5 | 1.00 |
| Hughes | 14 | 229 | 6 | 1.00 |
| Hughes | 14 | 230 | 7 | 1.00 |
| Hughes | 14B | 95 | 11 | 1.00 |
| Hughes | 14B | 96 | 12 | 1.00 |
| Hughes | 34 | 209 | 13 | 1.00 |
| Hughes | 34 | 210 | 14 | 1.00 |

Rural Highway

| | | | | |
|------------|-----|-----|----|-----|
| Minnehaha | 19 | 64 | 1 | .07 |
| Minnehaha | 38 | 349 | 16 | .07 |
| Pennington | 16 | 45 | 1 | .10 |
| Pennington | 16A | 59 | 5 | .10 |
| Pennington | 44 | 87 | 9 | .10 |
| Pennington | 44 | 107 | 10 | .10 |
| Lawrence | 385 | 122 | 8 | .66 |

| | | | | |
|----------|------|-----|-----|-----|
| Lawrence | 85 | 28 | 9 | .66 |
| Lawrence | 14A | 29 | 10 | .66 |
| Lawrence | 14A | 35 | 11 | .66 |
| Lawrence | 14A | 37 | 12 | .66 |
| Lawrence | 14A | 41 | 13 | .66 |
| Lawrence | 14A | 41 | 16 | .66 |
| Lawrence | 14A | 50 | 17. | .66 |
| Brown | 10 | 279 | 1 | .55 |
| Brown | 10 | 282 | 2 | .55 |
| Brown | 10 | 297 | 3 | .55 |
| Brown | 12 | 309 | 7 | .55 |
| Brown | 281 | 214 | 10 | .55 |
| Brown | 281 | 214 | 11 | .55 |
| Brown | 281S | 185 | 12 | .55 |
| Brown | 281N | 185 | 13 | .55 |
| Brown | 37 | 207 | 15 | .55 |
| Brown | 37 | 208 | 16 | .55 |
| Brown | 37 | 208 | 17 | .55 |
| Hughes | 83 | 138 | 1 | .69 |
| Hughes | 1804 | 256 | 2 | .69 |
| Hughes | 14 | 139 | 4 | .69 |
| Hughes | 14 | 246 | 8 | .69 |
| Hughes | 14 | 251 | 9 | .69 |
| Hughes | 14 | 263 | 10 | .69 |
| Hughes | 34 | 212 | 15 | .69 |
| Hughes | 34 | 232 | 16 | .69 |
| Hughes | 34 | 245 | 17 | .69 |
| Davison | 37 | 62 | 1 | .83 |
| Davison | 37 | 72 | 2 | .83 |
| Davison | 37 | 76 | 5 | .83 |
| Davison | 42 | 302 | 11 | .83 |
| Davison | 38 | 302 | 13 | .83 |
| Beadle | 14 | 333 | 1 | .83 |
| Beadle | 14 | 354 | 2 | .83 |
| Beadle | 14 | 354 | 3 | .83 |
| Beadle | 14 | 363 | 4 | .83 |
| Beadle | 14 | 316 | 5 | .83 |
| Beadle | 14 | 326 | 6 | .83 |
| Beadle | 14 | 326 | 7 | .83 |
| Beadle | 14 | 331 | 8 | .83 |
| Beadle | 28 | 269 | 9 | .83 |
| Beadle | 28 | 283 | 10 | .83 |
| Beadle | 28 | 298 | 11 | .83 |
| Beadle | 281 | 117 | 12 | .83 |
| Beadle | 37 | 133 | 16 | .83 |
| Beadle | 37 | 145 | 17 | .83 |
| Union | 46 | 365 | 6 | .88 |

| | | | | |
|-------------|------|-----|----|------|
| Union | 46 | 366 | 7 | .88 |
| Union | 46 | 380 | 8 | .88 |
| Union | 46 | 371 | 9 | .88 |
| Union | 11 | 9 | 10 | .88 |
| Union | 11 | 23 | 11 | .88 |
| Union | 11 | 35 | 12 | .88 |
| Union | 11 | 35 | 13 | .88 |
| Union | 50 | 423 | 14 | .88 |
| Charles Mix | 50 | 337 | 1 | .88 |
| Charles Mix | 50 | 329 | 2 | .88 |
| Charles Mix | 50 | 314 | 3 | .88 |
| Charles Mix | 50S | 299 | 4 | .88 |
| Charles Mix | 50N | 299 | 5 | .88 |
| Charles Mix | 50 | 273 | 6 | .88 |
| Charles Mix | 1804 | 90 | 7 | .88 |
| Charles Mix | 1804 | 120 | 8 | .88 |
| Charles Mix | 44 | 298 | 9 | .88 |
| Charles Mix | 44 | 305 | 10 | .88 |
| Charles Mix | 44 | 306 | 11 | .88 |
| Charles Mix | 45 | 27 | 12 | .88 |
| Charles Mix | 46 | 277 | 13 | .88 |
| Charles Mix | 46 | 288 | 14 | .88 |
| Charles Mix | 46 | 290 | 15 | .88 |
| Grant | 20 | 439 | 1 | 1.00 |
| Grant | 20 | 439 | 2 | 1.00 |
| Grant | 20 | 446 | 3 | 1.00 |
| Grant | 158 | 439 | 4 | 1.00 |
| Grant | 12 | 377 | 5 | 1.00 |
| Grant | 12 | 388 | 6 | 1.00 |
| Grant | 12 | 390 | 7 | 1.00 |
| Grant | 12 | 390 | 8 | 1.00 |
| Grant | 12 | 399 | 9 | 1.00 |
| Grant | 123 | 172 | 10 | 1.00 |
| Grant | 15 | 160 | 11 | 1.00 |
| Grant | 15 | 167 | 12 | 1.00 |
| Grant | 15 | 174 | 13 | 1.00 |
| Grant | 15 | 174 | 14 | 1.00 |
| Grant | 15 | 175 | 15 | 1.00 |
| Fall River | 18 | 62 | 1 | .65 |
| Fall River | 18 | 11 | 2 | .65 |
| Fall River | 18 | 12 | 3 | .65 |
| Fall River | 18 | 24 | 4 | .65 |
| Fall River | 471 | 7 | 5 | .65 |
| Fall River | 471 | 21 | 6 | .65 |
| Fall River | 471 | 27 | 7 | .65 |
| Fall River | 89 | 29 | 8 | .65 |
| Fall River | 71 | 1 | 9 | .65 |

| | | | | |
|------------|------|-----|----|------|
| Fall River | 71 | 2 | 10 | .65 |
| Fall River | 71 | 7 | 11 | .65 |
| Fall River | 71 | 27 | 12 | .65 |
| Fall River | 71 | 35 | 13 | .65 |
| Fall River | 385 | 39 | 14 | .65 |
| Fall River | 79 | 26 | 15 | .65 |
| Fall River | 385 | 12 | 16 | .65 |
| Fall River | 385 | 13 | 17 | .65 |
| Tripp | 53 | 26 | 1 | 1.00 |
| Tripp | 183S | 5 | 2 | 1.00 |
| Tripp | 183S | 19 | 3 | 1.00 |
| Tripp | 183N | 43 | 4 | 1.00 |
| Tripp | 183N | 61 | 5 | 1.00 |
| Tripp | 49 | 18 | 6 | 1.00 |
| Tripp | 49 | 27 | 7 | 1.00 |
| Tripp | 49 | 42 | 8 | 1.00 |
| Tripp | 18 | 242 | 9 | 1.00 |
| Tripp | 18 | 252 | 10 | 1.00 |
| Tripp | 18 | 252 | 11 | 1.00 |
| Tripp | 18 | 273 | 12 | 1.00 |
| Tripp | 44 | 237 | 13 | 1.00 |
| Tripp | 44 | 270 | 14 | 1.00 |
| Kingsbury | 25 | 114 | 1 | 1.00 |
| Kingsbury | 25 | 120 | 2 | 1.00 |
| Kingsbury | 81 | 116 | 3 | 1.00 |
| Kingsbury | 81 | 119 | 4 | 1.00 |
| Kingsbury | 81 | 125 | 5 | 1.00 |
| Kingsbury | 14 | 363 | 6 | 1.00 |
| Kingsbury | 14 | 365 | 7 | 1.00 |
| Kingsbury | 14 | 378 | 8 | 1.00 |
| Kingsbury | 14 | 378 | 9 | 1.00 |
| Kingsbury | 14 | 383 | 10 | 1.00 |
| Kingsbury | 14 | 387 | 11 | 1.00 |
| Kingsbury | 14 | 390 | 12 | 1.00 |
| Kingsbury | 14 | 400 | 13 | 1.00 |
| Kingsbury | 25 | 113 | 14 | 1.00 |

Appendix B

Observer Manual – 2001 South Dakota Seatbelt Survey

Observer Manual

2001 South Dakota
Seatbelt Survey

INSTRUCTIONS FOR USING THE SOUTH DAKOTA SEATBELT SURVEY FORM

South Dakota Statewide Seatbelt Survey

Fall, 2001

The South Dakota Seatbelt Survey Form has been designed so that a lot of information can be efficiently collected about seatbelt use on our state roads. The form allows for collection of seat belt use data for all drivers and right front passengers in non-commercial vehicles, as well as children age five and under anywhere in the car. The form is constructed so that each driver and passengers (when they are present) receive one full line of data -- 22 columns across the page. The first 8 columns are used to record information about the vehicle and the occupant. The first information recorded is the vehicle sequence number and whether the vehicle is a car, a van/truck/station wagon/minivan or Sport Utility Vehicle (SUV).

The occupant information includes whether the person is a driver, a right front seat passenger (of any age), an additional child 0-4 years in the front, or a child 0-4 years in the back seat. The most important information is whether the occupant has on a seatbelt or is in a child restraint. Age of the occupant is guessed at to determine restraint use for children and teenagers. Finally, the license plate is recorded as being either in state or out of state.

The remaining 13 columns are used for recording "demographic" information about the observation such as county, site number, time of day, and road type. The vehicle-occupant information must be recorded immediately as the Observer watches people in passing vehicles. The demographic information, however, only has to be written once on the first line of the first coding form used. When the coding sheets are processed, the demographic information will be automatically duplicated for all persons recorded during that 40-minute observation session.

Note: The observer procedures described in this manual are identical to those in the 2000 manual. We have tried to clarify some procedures with better instructions. Cindy Struckman-Johnson will be the sole contact person. (Carryl Baldwin has moved out of state. She will help with the study but she is no longer available for phone calls.)

INSTRUCTIONS

Observers will be provided an Observer Site Schedule that will show the time and place to observe traffic over a 4-day period. An additional week is listed in case there is a need to select an alternate observation date. They will receive an Observation Site List that contains the numbers and descriptions of the observation sites. Maps of the observation sites will also be provided. Sites include road segments between mile markers that are located along urban and rural highways and interstates. Each site will be monitored for a 40-minute session during one of 6 time slots spread over the 4-day period. The observations are conducted according to the following steps.

1) Preparation for the Observation Session:

Observers should wear an orange safety vest issued by the SD Office of Highway Safety to increase their visibility to passing traffic. Observers should carry their observation sheets on a clipboard and use a number 2 pencil for recording information. Do not use ink or flair pens. It is very important that Observers write numbers clearly so that they can be entered correctly into the computer. Cross "7"s so that they can be distinguished from "1"s.

2) Arrival on Site and selection of an Observation Area:

Observers should reach their observation site a few minutes before they plan to begin the observation session. Note that scheduled time periods are 1½ hour periods and the observation session is only for 40 minutes. This will give Observers some leeway in start and stop times. Make sure you allow plenty of time to finish and get to the next site on time.

Before the observation session begins, the Observer should record the demographic information in columns 9 - 22 on the first row of the observation sheet. Most of the codes for the demographic information are on the top of the observation form. Information about "Road Type" is on the Site List. This information only has to be coded once for each 40-minute observation session.

Observers will then choose a position at the site that provides the best view of occupants in vehicles. For urban road sites, choose sites that allow observation of vehicles that have stopped for a red light or stop sign, or slowed for a yield sign. The best position is usually on the curb next to a right-hand turn lane on urban sites. For rural segments, intersections or junctions provide a safe yet effective observation position.

Observers should stand at the safest possible position either on the curb or well to the side of the road which allows them a good view inside the front seat of cars/vans/trucks and sport utility vehicles which will be stopping or slowing at the site. Observers must be careful not to step into the roadway and endanger themselves as they attempt to look inside passing vehicles. It is better to be safe and guess about some information than it is to put oneself at risk for a thorough look. Do not observe in stormy weather with lightning.

3) Selection and Coding of the First Vehicle:

When the Observer is ready to record data, he/she will observe the first non-commercial car mini-van, van, pickup-truck, or sport utility vehicle (SUV) to stop at the site. **IMPORTANT:**

Commercial vehicles of any type (cars, station wagons, mini-vans, vans, pickup trucks, and large trucks) will not be included in the survey. Commercial vehicles are those with commercial license plates and/or commercial signing or lettering of any kind on the vehicle.

Information about the vehicle will then be coded. The first vehicle is assigned the sequence number "001" and marked as either a car, a truck/van/mini-van/station wagon or as an SUV. The next code indicates the position of the person in the vehicle (driver or a passenger). Then the drivers' seat belt use is coded. If there is a right front vehicle passenger, the next line of the form is used to code passenger information. This line also begins with a sequence number of "001" because it is the same vehicle. If there is a child 0-4 years of age in addition to the right seat passenger, (e.g., one who is sitting or standing on the right front seat passenger's lap, in the center front seat), record information about the child on the next line starting with the same vehicle number "001". If there are any children 0-4 years in the back seat, code information about each child on a separate line starting with the same vehicle number.

Observers may not always be able to record accurately all information about the vehicle. The best strategy is to record the most important information first: seat belt use and age. Then, move to other categories such as vehicle type (car versus van/pick-up versus SUV). Record the state of license plate last, skipping it if you must.

4) Selection of Vehicles Throughout the Observation Session:

Cars and Vans/Trucks and Sport Utility Vehicles:

If traffic flow is heavy (an average of more than 1 vehicle per minute), observe every other vehicle that stops or slows down. For example, after the first car or van/truck has been coded as Vehicle ID "001", the Observer should let one car or van/truck stop and leave and then code data on the next vehicle that stops as Vehicle ID Number "002". Repeat the pattern for the next session.

If the traffic flow is lighter such that less than one vehicle stops every minute, Observers should record data on every car/van/truck/SUV that stops or slows down. If a vehicle containing several children takes a lot of time to code, skip the next one or two vehicles until you are ready to code again.

5) Completing the Observation Session:

At the end of the 40-minute observation session, Observers should go to the box in the lower right corner of the first survey form used for the session and check whether every car or every other car was observed. Then, Observers should count the total number of cars/vans/trucks and Sport Utility Vehicles observed for the session. (This information is coded in the Veh Type column.) Record these totals in the lower half of the box on the first page of the forms used for this session. **Note that the sum of all vehicle types should match the highest Vehicle ID Number for the session - be careful not to count vehicles with passengers more than once.** Scan handwriting and correct unreadable numbers. The survey forms should be clipped together in correct order, and stored in a safe, dry place until they are returned to Cindy Struckman-Johnson.

6) Starting the Next Observation Session:

At the Observer's next 40 minute observation session, he/she should begin with a new survey form and the Vehicle ID numbers should begin again with "001". Demographic information for this site should be recorded on the first line of the coding sheet.

DESCRIPTIONS OF CATEGORIES AND CODES

Observers should use the codes exactly as described. The most common mistake is to forget to fill in "0"'s for double or triple digit codes. For example, for the first vehicle observed, record "001" instead of a "1" followed by two blanks in the columns for vehicle ID number. See Appendix A for an explanation of some sample coding.

Vehicle ID Number

During each observation session, the Observer will assign a sequential "Vehicle ID number" to each vehicle that is sampled (selected for observation). The sequential ID's should start with "001" each session. ID numbers for an observation session in heavy traffic will probably run from 001 through 070. The same Vehicle ID Number is assigned to the driver of a vehicle and the passengers. In other words, if a vehicle has only a driver, only one line of the coding form will be used for the vehicle. If the vehicle has a driver and a passenger, two or more lines of the coding form will be used for the vehicle and all will have the same Vehicle ID Number. Each child 0-4 years of age in addition to the right front passenger will be coded on a separate line with the same vehicle code.

Veh Type

Non-commercial passenger cars are coded as "1". All other non-commercial vehicles (mini-vans, station wagons, vans, pickup trucks, etc.) **except** sport utility vehicles are coded as "2". Sport Utility Vehicles of all types are coded as "3". Sport utility vehicles are being coded separately for future research purposes. **Remember, commercial vehicles of any type are not to be included in the survey.**

Drive/Pass

Drivers are coded as "1". Passengers of any age, child or adult, in the right front seat are recorded as "2". Extra children (0-4 years) in the front who are sitting or standing on the lap of the right front passenger or are sitting or standing in the center are recorded as "3". Children (0-4 years) anywhere in the backseat are recorded as "4".

Seatbelt Use

As soon as a vehicle stops, Observers should immediately determine whether the driver and right front passenger or any children under the age of 5 are wearing a safety restraint. A "1" means safety equipment was present. A "2" means it was not present. A "3" is used for the special case when a child passenger is in a child restraint device or car seat.

Seatbelt use is determined by the **shoulder strap of the seatbelt or by the use of a child restraint.**

Using a shoulder strap as an indicator is a procedure that the National Highway Traffic Safety Administration has standardized for seatbelt surveys across the country. Although it may not be 100% accurate because some cars have lap belts and no shoulder strap, using shoulder straps as indicators has been determined to be more accurate in the long run than trying to see inside of cars to check for lap belts.

For the driver code "1" if a shoulder strap is in use. Code "2" if the shoulder strap is not in use.

If there is a right front passenger of any age, start a new line of code with the same vehicle sequence number used for the driver on the previous line. For the right front passenger code "1" if a shoulder strap is in use. Code "3" if a child restraint (car safety seat, infant carrier, special harness to supplement the standard lap/shoulder belt, etc.) is in use. Code "2" if NEITHER the shoulder strap nor a child restraint is in use.

If there is a child 0-4 years of age in the front seat **in addition to** the right front seat passenger, start a new line of code with the same vehicle number used for the driver and passenger in the previous lines. Code "3" if a child restraint is in use. Code "2" if a child restraint is not in use. Code "1" in the event that the child 0-4 years of age is restrained by only a shoulder belt, but not a child restraint. If there is a child or children 0-4 years of age in the backseat, start a new line of code with the same vehicle number. Start a new line of code for each additional child 0-4 years of age using the same vehicle code.

Age

Observers should pay special attention to judging the age of child occupants.

If the occupant is an "infant" to 4 years old, code "1".

If the occupant appears to be 5 to 13 years old, code "2".

If the occupant appears to be 14 to 17 years old, code "3".

If the occupant appears to be 18 years old or older, code "4".

If it is absolutely impossible to determine the age of a vehicle occupant, code "5" for unknown. You should **not** use this category when you are uncertain about the exact age of an occupant, e.g., you are not

not sure if an occupant is 13 or 14. If you are uncertain, make your best guess. The unknown category is reserved for only those cases when you can not determine age at all, e.g., large hat obscuring face of vehicle occupant.

Lic State

This column is used to indicate whether or not the license plate on the observed vehicle is from South Dakota of another state. Code "1" for a South Dakota plate (regardless of county of origin). Code "2" for any out of state plate. Code "3" if you absolutely could not determine whether or not the plate was in-state or out of state.

THE REMAINING CODES ARE RECORDED ONLY ONCE ON THE FIRST LINE OF THE FIRST FORM USED AT A SITE.

County

Code the appropriate number for the thirteen counties listed on the Observer Form.

Site

Observers will be given an "Observation Site List" which will list all observation sites in the county and a two-digit Site Number for each site. Observers should code the appropriate Site Number for each 40-minute observation session.

Time

The Time category refers to the time of day that the observation session is scheduled.

- 1 = 7:30 to 9:00 A.M.
- 2 = 9:00 to 10:30 A.M.
- 3 = 10:30 to 12 noon
- 4 = 12 noon to 1:30P.M.
- 5 = 1:30 to 3:00P.M.
- 6 = 3:00 to 4:30 P.M.

Month/Day/Year

Record the full date of the observation day --including "0"s --in these six spaces. For example, October 17, 2001 would be recorded as "10 1701".

Observer

Each Observer will enter his or her first and last initial initials on the coding sheet for identification purposes.

Road Type

The Observation Site List provided to all observers will have a "Road Type" code for each site. PLEASE USE THE ROAD TYPE NUMBER ASSIGNED IN THE SITE LIST. The sites have been assigned the codes of 1 (Urban Highway), 2 (Rural Highway), 3 (Urban Interstate) and 4(Rural Interstate) based on Department of Transportation definitions. Please do not guess at the road type code.

******* IMPORTANT *******

If you have any questions about this manual or any of the survey procedures, call Cindy Struckman-Johnson in the Human Factors Lab at the University of South Dakota at (605) 677-5295 or (605) 677-5098 in the afternoon or 605-624-8858 in the mornings and evenings. If Cindy is not available, please leave a message with a number and a good time to call you and she will return your call.

APPENDIX A

SEATBELT SURVEY FORM EXAMPLES

The last page of this appendix contains an example of a partially completed survey form. It contains coding for 5 vehicles at a hypothetical observation site in Brown County. What follows is an explanation of why the codes shown on the sample form have been used. These examples have been selected to demonstrate many of the things you will commonly encounter while observing as well as some things you need to be careful about.

Vehicle 001 - Driver Only

There is only a single line with the vehicle ID 001, so this vehicle did not have a passenger. Note that vehicle 1 is coded "001" not "1". The vehicle type is coded as "1," so this vehicle must have been a non-commercial car. The third thing that is coded is "1" for Drive/Pass/Extra. This line of entries describes a driver. The next column indicates the driver's belt use. Because this is coded as "1", a shoulder belt was in use. Age is coded "4" meaning that the driver is 18 years of age or older. The "1" in the Lic State column means the vehicle plate was from South Dakota.

The remaining columns of information apply to all the vehicles coded on this sheet, so only one line of data needs to be entered for the entire sheet. County is coded "07" since this example takes place in Brown County. Note that the 7 is crossed so the data entry person will have no difficulty telling the difference between 1's and sloppy 7's. The next 2 columns are the code for the particular site within Brown County. Each observer will be provided with a list of codes for all sites at which he/she will be observing. Time is coded as "2" meaning that the observation is taking place between 9:00 and 10:30 A.M. The next six columns code the month, day and year of the observation in that order. The next two columns are for the first and last initials of the observer. In this example, Donna Smith was observing so "D" and "S" are recorded in these two columns. The next column indicates the type of road on which the observation is taking place. Because the observation site is a highway that runs through a city, the correct road type is urban highway and code "1" is entered. Please do not guess at the road type. Instead use the road type code that appears on the site list. The definitions of road type were determined by the Department of Transportation and may not fit your idea of an urban or rural highway.

Vehicle 002 - Driver /Right front passenger (Child -0-4 years)

Vehicle 002 is a car and has two lines of code and a "3" in the Veh Type column indicating an SUV with a driver and passenger. The driver line indicates a shoulder belt was used (Seat belt use code "1") and that driver was at least 18 years old. The car has South Dakota plates.

The passenger line for Vehicle 002 indicates that the passenger was a child 0-4 years of age in the right front seat (Drive/Pass/Extra = "2") in a child restraint (Seat belt use = "3"). It is extremely important to the survey that child restraint use be coded correctly. If a passenger is **USING** a child restraint, "3" is the correct code for the Belt use column. Do **NOT** code "1" (shoulder belt used) even if a shoulder belt is being used to hold the child restraint in place. Finally do **NOT** use code "3" if an empty child restraint is present in the front seat. The age is coded as "1" indicating that the passenger was between 0 and 4 years of age. The final column for the Vehicle 002 passenger line repeats the South Dakota license plate code "1".

Vehicle 003 - Driver /Right front passenger/ Child 0-4 in front/ Non-recorded older child

Vehicle 003 has three lines of code indicating a driver and more than one passenger. The Veh Type column for vehicle 003 is coded as "2" indicating that the vehicle was a pickup, van or station wagon. The driver line (code "1" in Drive/Pass/Extra) has an entry for Belt Use indicating that the driver was not wearing a seat belt (code = "2"). Note that the same code value is used to indicate a vehicle occupant is not wearing a shoulder harness or using a child restraint for all vehicle types. The remaining codes for the driver of vehicle 003 indicate that the driver is 18 years old or older and that the pickup, van, or station wagon had out-of-state license plates, coded "2".

The next line of information for the first passenger of vehicle 003 duplicates the Vehicle ID Number and Veh Type codes. The Drive/Pass column is coded "2" to indicate a right front seat passenger. The Belt Use column is coded "1" indicating that the passenger was wearing a seat belt. The next column of the passenger information records age. Code "5" is entered in this example. Code "5" stands for "Unknown". In this example, the age is unknown because the child on her lap blocked the passenger's face from view. This is one of the few situations in which code "5" is appropriate. Code "5" should not be used in cases when you are not sure whether a person is 4 or 5, 13 or 14, or 17 or 18. If you are not sure about age category, make your best guess. Use code "5" only in those cases when you can't tell age at all. The final column of the first passenger data duplicates the out of state license code from the previous line for this vehicle.

The third line of information for vehicle 003 again duplicates the Vehicle ID Number and the Veh Type codes. The Drive/Pass column is coded as "3" indicating that there was a child 0-4 years of age in the front seat in addition to the right front passenger coded on the previous line. (In this case the child 0-4 years of age had been seated on the right front passengers lap.) The Belt Use column is coded as "2" indicating the child was not in a child restraint device. The Age column indicates that the child was 0-4 years of age. The Lic State code duplicates the "2" indicating an out of state license plate as recorded on the previous two lines for vehicle 003.

A fourth child was present in the center of the seat. However, no information was recorded for this child since the child was estimated to be in the age category of 5-13 years.

Note: When more than two lines of code are used for the same vehicle, the age column will always be coded as a "1" indicating a child 0-4 years of age, and the "Drive/Pass or Extra" column will always be coded as either a "3" or a "4" to distinguish whether the 0-4 year old child was in the front or back seat. No information is recorded for persons aged 5 years or older unless they are either the driver or a passenger in the right front seat.

Vehicle 004 - Driver /Two backseat passengers (0-4 years)

Vehicle 004 is a car with three lines of code and a "1" in the Veh Type column indicating a car with a driver and at least two passengers. The driver line indicates a shoulder belt was used (code "1") and that driver was at least 18 years old. The car has South Dakota plates.

The second line for Vehicle 004 indicates that a child 0-4 years of age was seated in the back seat (passenger code 4) in a child restraint (code = "3"). The age is coded as "1" indicating that the passenger was 0-4 years of age. The final column for the Vehicle 004 passenger line repeats the South Dakota license plate code "1".

The third line for Vehicle 004 indicates that a second child (0-4 years of age) was present in the back seat (Drive/Pass or Extra is coded as "4"). This child 0-4 years old was not in a child restraint as indicated by the Seat Belt Use code "2". Age is coded as "1" and the License plate information is repeated as "1" indicating a vehicle with South Dakota license plates as recorded on the previous two lines.

Vehicle 005 - Driver /Backseat passenger (0-4 years)

Vehicle 005 has two lines of code. A "1" in the Vehicle Type column indicates this was a car. The driver was wearing a seat belt (Seat belt use code = "1") and was between 14 and 17 years of age (Age code "3"). The vehicle had South Dakota license plates.

The second line of code for vehicle 005 repeats the vehicle type information. The Drive/Pass/Extra code of "4" indicates that there was a child 0-4 years of age in the back seat. The Seat belt use code is "1" for this passenger indicating that the child 0-4 years was wearing a shoulder belt but was not in a child restraint device.

Observation Session Summary Box

The observation session summary box in the lower right hand corner of the sample form would be completed if this were the first page of information collected at a site. Because this example starts with Vehicle ID Number 001, this is a first sheet.

The upper half of the box indicates whether every vehicle was observed (normal traffic conditions) or every other vehicle was observed (heavy traffic conditions). The "Every Car Observed" line is checked since traffic was obviously light enough for this strategy.

The lower half of the box indicates the total number of vehicles observed during the 40-minute observation session. In this case, there were 3 cars, 1 sport utility vehicle, and 1 pickup/van/ or station wagon for a total of 5 vehicles. Note that these numbers represent ALL vehicles observed during the entire 40-minute observation session that normally will be recorded on several sheets. At the end of an observation session, you will need to count vehicles on ALL forms used during that session, but you should only enter the totals on the first sheet.

The lower box is used for recording a verbal description of the actual location used for observation. Terminology similar to that used on the site list is expected. For this example the observer was located at the interchange of Hwy. 281 and Hwy. 12 observing all traffic turning onto Hwy. 281.

The survey summary box and the location description box will be blank on all observation sheets except the first one used at each site.

Remember: Use a number 2 pencil so that you may erase and clarify coding information written unclearly when the observation period is over. Information for the driver should always be coded first followed by an additional line with the same vehicle number for the right front passenger and any additional passengers between the ages of 0 and 4 years.

STAY SAFE AND GOOD LUCK!

South Dakota Se-belt Survey Form

Vehicle Type
 Car = 1
 Pickup/Van = 2
 Sport Utility = 3

Seatbelt Use
 Used = 1
 Not Used = 2
 Child Restraint Used = 3

License State
 South Dakota = 1
 Other State = 2
 Unknown = 3

County
 Minnehaha = 01
 Pennington = 02
 Brown = 03
 Lawrence = 04
 Davison = 05
 Beadle = 06
 Hughes = 07
 Union = 08
 Charles Mix = 09
 Grant = 10
 Fall River = 11
 Tripp = 12
 Kingsberry = 13

Site Number
 Check County
 Site
 Time
 7:30 - 9:00 am = 1
 9:00 - 10:30 am = 2
 10:30 - noon = 3
 noon - 1:30 pm = 4
 1:30 - 3:00 pm = 5
 3:00 - 4:30 pm = 6

Road Type
 Urban Highway = 1
 Rural Highway = 2
 Urban Interstate = 3
 Rural Interstate = 4

Driver / Passenger/Extra
 Driver = 1
 Right Front Passenger = 2
 Extra Child Front = 3
 Child Rear = 4

Age
 Infant to 4 = 1
 5 to 13 = 2
 14 to 17 = 3
 18 or over = 4
 Unknown = 5

| Vehicle ID Number | Veh Type | Drive Pass or Extra | Seat Belt Use | Age | Lic State | County | Site Number | Time | Month | Day | Year | Observer | Road Type |
|-------------------|----------|---------------------|---------------|-----|-----------|--------|-------------|------|-------|-----|------|----------|-----------|
| 001 | 1 | 1 | 1 | 4 | 1 | 07 | 03 | 2 | 10 | 19 | 01 | 05 | 1 |
| 002 | 3 | 1 | 1 | 4 | 1 | | | | | | | | |
| 002 | 3 | 2 | 3 | 1 | 1 | | | | | | | | |
| 003 | 2 | 1 | 2 | 4 | 2 | | | | | | | | |
| 003 | 2 | 2 | 1 | 5 | 2 | | | | | | | | |
| 003 | 2 | 3 | 2 | 1 | 2 | | | | | | | | |
| 004 | 1 | 1 | 1 | 4 | 1 | | | | | | | | |
| 004 | 1 | 4 | 3 | 1 | 1 | | | | | | | | |
| 004 | 1 | 4 | 2 | 1 | 1 | | | | | | | | |
| 005 | 1 | 1 | 1 | 3 | 1 | | | | | | | | |
| 005 | 1 | 4 | 1 | 1 | 1 | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

Check One

Every vehicle observed ☒

Every other vehicle observed _____

Total vehicles observed in 40 minutes 5

Describe your observing location at this site:

Intersection of 281 & 12 - Street on the North corner by Stop sign watched traffic turning onto 281

Appendix C

Computation of Mean Seat Belt Use for South Dakota

The computation of the mean seatbelt use for in South Dakota was a three-stage process. Stage 1 consisted of computing mean seat belt use for each road type in each county. For purposes of this calculation, only drivers and right front seat passengers were considered to retain compatibility to 1998 values and Federal reporting requirements. In this computation, the vehicle miles traveled value (VMT) for a particular site was computed by averaging the VMT values for each of the subsegments in the road segment the selected site represented. These VMT values were then used to compute a weighted average for all sites for a particular road type in a particular county. This weighted mean seatbelt use rate for a particular road type in a particular county is designated

\hat{P}_{ij} where i denotes road type (from 1 to 4) and j denotes county (from 1 to 13).

The second stage of the computation consisted of computing weighted means for each road type across counties based on the vehicle miles traveled (VMT) on that road type in each county and on the sampling weight for the county based on probability of selection for surveying for that county. The mean seatbelt use for a road type is

$$\hat{P}_i = \frac{\sum_{j=1}^{13} W_{.j} V_{ij} \hat{P}_{ij}}{\sum_{j=1}^{13} W_{.j} V_{ij}}$$

Where \hat{P}_i = the seat belt use estimate for road type i

$W_{.j}$ is the county weight for county j (1 for Minnehaha and Pennington, 31/11 for the remaining 11 counties)

V_{ij} is the VMT for road type i in county j

\hat{P}_{ij} is the seatbelt use rate estimated for road type i and county j in stage 1.

The final stage of the estimate consisted of computing the weighted average of the across county road type estimates for a statewide estimate. Weights were based on the proportion of the state's VMT on each road type.

The formula for computing the statewide estimate is

$$\hat{P} = \frac{\sum_{i=1}^4 V_i \hat{P}_i}{\sum_{i=1}^4 V_i}$$

Where \hat{P} = the statewide seat belt use estimate

V_i is the proportion of VMT for road type i in the state

\hat{P}_i is the rate estimated for road type i in the state stage 2.

In the 2001 South Dakota Survey, the following values were obtained

| | | |
|-------------------|-----------------|---------------------|
| Urban Highway: | $w_1 = 0.18323$ | $\hat{P}_1 = 55.39$ |
| Rural Highway: | $w_2 = 0.44819$ | $\hat{P}_2 = 57.51$ |
| Urban interstate: | $w_3 = 0.05521$ | $\hat{P}_3 = 67.06$ |
| Rural interstate: | $w_4 = 0.31336$ | $\hat{P}_4 = 75.45$ |

Thus, statewide seat belt use is estimated as **63.27%**.

Computation of Variance and Confidence Bounds for Mean Seat Belt Use for South Dakota

Computational formula for the variance of \hat{P} , using the terms as defined in the computation of the weighted use estimate above, is

$$Var(\hat{P}) = \frac{\sum_{i=1}^4 \sum_{j=1}^{13} (W'_{ij})^2 * (\hat{P}_{ij} - \hat{P})^2}{n^* - 1}$$

where n^* = the number of county-road type groups

The W'_{ij} in the formula are weights applied to the deviations based on the formula below

$$W'_{ij} = \frac{W_{.j} * V_{ij}}{\sum_{i=1}^4 \sum_{j=1}^{13} W_{.j} W_{ij}}$$

where the W 's and V in the formula are as define previously in discussion of the second stage of the analysis.

Using these formulas, the variance of \hat{P} is 0.215. The sampling error is then 0.464%.

Now, the 95% confidence bounds can be computed as the:

$$(\text{statewide mean}) \pm (1.96)(0.464).$$

Thus, the 95% confidence bounds on our mean estimate are:

$$63.27 \pm (1.96)(0.464) \text{ or } p(62.36\% < \text{Statewide Use} < 64.18\%) = .95$$